Current Science

Vol. XVIII] OCTOBER 1949 [No. 10

	Page
Maximization of Scientific Effort	365
The Indian Science Congress, Poona	366
Acetylation in the Laboratory Diagnosis of "Burning Feet Syndrome" (Pantothenic Acid Deficiency)—P. S. Sarma, P. S. Menon and P. S. Venkatachalam	367
The Life-History of a Typical Funnel Cloud—Dr. M. W. Chiplonkar,	368
Obituary—The Late Prof. M. S. Sabhesan	370
Regional Scientific Bibliography for S. E. Asia	370
Letters to the Editor	371
Reviews	384
Science Notes and News	392

MAXIMIZATION OF SCIENTIFIC EFFORT

IN the course of his memorable address to the Staff and Students of the Indian Institute of Science, early this year, Prime Minister Nehru told his audience that the quality and output of scientific work in India were commensurate neither with the amount of funds allotted for research nor with the potential scientific talent which the country could mobilise. This unhappy circumstance is due largely to the lack of a congenial "research climate" which would stimulate and inspire scientific effort. The "Research climate" *can* be created ; it is the spontaneous result of dynamic and inspiring leadership and enlightened administration free from pettiness and red tape.

Magnificent and stately buildings, lavishly equipped laboratories, the latest and the most modern tools of research, and an abundance of grants, by themselves, cannot bring about the research climate; it is the *men* that count in this respect. At the moment, we have very few men in the country who can be trusted to achieve this difficult but indispensable task of creating a proper atmosphere for nurturing scientific talent and promoting research. Some of our foremost institutions and universities are suffering for want of such men. The adoption of a policy of the short-sighted and bigotted parochialism in recruiting men of science for responsible positions, has led to disastrous results in the case of some of the research institutions in the country. If we are to make any worthwhile contributions to world's science and technology we should not hesitate to draw freely from the world's pool of scientific and administrative talent with a view to make up our deficiencies. Other countries have adopted such a policy in the past. We are gratified to learn from the latest despatches appearing in the press that, the Government of India, acting on the advice of Pandit Nehru, have already moved to take the necessary steps in this direction.

THE INDIAN SCIENCE CONGRESS, POONA

THE Indian Science Congress is scheduled to hold its 37th session at Poona from 2nd to 8th January, 1950. The President is Sir K. S. Krishnan and the President-elect is Prof. P. C. Mahalanobis. Honourable Dr. Shyamaprasad Mukherjee, Minister for Industries and Supplies, Government of India, will inaugurate the session and His Excellency Sir Maharaj Singh, Governor of Bombay, has been approached to become the Patron for the session. The Vice-Chancellor of the Poona University has extended an invitation to all scientists interested in the development of science to assemble at Poona and help in making the deliberations of the session a success.

The work of the Indian Science Congress session will be organised into 13 different sections, each presided over by a Sectional President. The following are the Sectional Presidents: Dr. N. M. Basu (Aligarh), Mathematics; Dr. P. V. Sukhatme (New Delhi), Statistics; Dr. R. N. Ghosh (Allahabad), Physics; Dr. J. K. Chowdhury (Calcutta), Chemistry; Mr. J. Coates (New Delhi), Geology and Geography; Dr. P. Maheshwari (Delhi), Botany; Dr. B. C. Basu, (Izatnagar), Zoology and Entomology, Dr. Von Fuhrer Haimendorf (Hyderabad), Anthropology and Archæology; Dr. M. V. Radhakrishna Rao (Bombay), Medical and Veterinary Sciences; Mr. R. L. Sethi (New Delhi), Agricultural Sciences; Dr. Kalidas Mitra (New Delhi), Physiology; Prof. Kali Prasad (Lucknow), Psychology & Educational Sciences; Dr. D. R. Malhotra (Ajmir), Engineering and Metallurgy. Meetings of each section will be normally held every day, where original papers will be read. Discussions on subjects of special scientific interest have also been arranged both in individual sections as well as jointly in more than one section.

Foreign Scientists

As on previous sessions of the Congress at Delhi, Patna and Allahabad, a special feature of the Poona Congress will be the visit of a delegation of front-ranking overseas scientists from Great Britain, America and France. Invitations have already been extended to these delegates by the Indian Science Congress Association and also by the Department of Scientific Research, Government of India, through the various Indian Embassies in foreign countries. It is expected that the team from Great Britain would consist of Sir Robert Robinson, President of the Royal Society, London, Prof. J. H. Burn, Britain's top-ranking Pharmacologist in the Oxford University, and Prof. Desmond Bernal, the distinguished Physicist. From America Prof. Herman Mark, the internationally known expert on high polymers, originally of Germany and Prof. Szent Gyorgyi, the celebrated Biochemist, originally of Hungary, have been invited. France is sending Professor and Madame Curie-Joliot, known all over the world for their contributions to Atomic Physics. Invitations have also been sent to many learned societies and bodies in Afganistan, Ceylon, Australia, Canada, etc., to send their delegates to the session, if possible. It is hoped that the overseas scientists would be staying here for a period of about two months and would deliver lectures and give demonstratons in the various academic centres throughout India.

Popular Lectures

A special feature of the Congress would be the organisation of a series of 'popular lectures' on scientific subjects, which will be arranged in the evening. The subjects of the lectures are chosen in such a manner that the best scientific brains of India and foreign countries can place before the public in a popular way the implications of science in social welfare and the achievements of sciences towards nation-building activities. Arrangements are being made to have some of these lectures broadcast and the Association will later publish them for distribution to learned societies, bodies and institutions, etc.

Universities and other academic centres desirous of arranging lectures and discussions by foreign scientists in their institutions are requested to get into touch with the General Secretaries (Dr. B. Mukerji, 1, Park Street, Calcutta, and Prof. B. Sanjiva Rao, Indian Institute of Science, Bangalore).

ACETYLATION IN THE LABORATORY DIAGNOSIS OF "BURNING FEET SYNDROME" (PANTOTHENIC ACID DEFICIENCY)

P. S. SARMA,* P. S. MENON AND P. S. VENKATACHALAM

(Nutrition Research Laboratories, Indian Research Fund Association, Coonoor, South India)

LIPMANN and his co-workers have shown that coenzyme A, which is concerned with the *in vitro* acetylations of sulfanilamide and choline contains large amounts of pantothenic acid.[1, 2, 3] Riggs and Hegsted[4] found subsequently that acetylation in rats depended on an adequate intake of pantothenic acid. Normal rats acetylated 70% of the amount excreted in 24 hours after a 1 mgm. or 2·5 mgm. dose of para-amino benzoic acid (PAB) given intraperitoneally. On the other hand, rats which were pantothenic acid deficient, acetylated only 50% of a 1 mgm. dose and 37% of a 2.5 mgm. dose of PAB. Simultaneous injections of one mgm. of calcium pantothenate to the deficient animals caused a return of their acetylation values to normal.

The 'burning feet syndrome' in humans has been investigated by Gopalan.[5] He has attributed the syndrome to the deficiency of pantothenic acid and has obtained remarkable improvement by the administration of calcium pantothenate. Glusman has also described this syndrome of burning feet as a manifestation of nutritional deficiency.[6] The present investigation deals with acetylation of PAB in humans both normal and those suffering from 'burning feet syndrome'.

The diagnosis of 'burning feet syndrome' is based on the description of the symptoms given by the patients. All the patients examined, complained of a burning sensation of the soles of the feet, which was comparable to that of keeping the feet on red hot coal. The burning sensation increased after walking and also after covering the feet with a blanket. Some cases complained of tingling and numbness of the toes. Dryness of the skin, angular stomatitis, cheilosis and fissured tongue were also frequently found in association with burning feet. The tendon reflexes were brisk; there were no sensory changes or muscular wasting. Treatment with riboflavin did not give any relief as far as burning feet was concerned, though manifestations of riboflavin deficiency disappeared. Thiamin and nicotinic acid were ineffective. With intramuscular injections of 50 mgm. of pantothenol daily,[7] mild cases of 'burning feet syndrome' obtained relief after a week's therapy, whereas in more severe cases, complete cure was obtained after similar treatment for a period of two to three weeks.

Acetylation was determined by the administration of either 100 mgm. or 200 mgm. of PAB to patients, collecting their 24 hours' urine immediately thereafter, and determining the free and total content of PAB in the urine by the method of Bratton and Marshall.[5] The results are presented in Table I along with the acetylation values obtained after treatment with either riboflavin or pantothenol. Eleven normal persons had an acetylation value of 91·5% when 100 mgm. PAB was given, while eight had 91% when 200 mgm. PAB was administered orally. Intramuscular injections of either riboflavin or pantothenol did not change the acetylation values, when determined on some of these normal persons. However, in patients, who were suffering from 'burning feet syndrome', the acetylation value was found to have decreased to 84·9%, when 100 mgm. PAB was given and to 78·9% when 200 mgm. PAB was the dosage employed. Treatment with riboflavin, thiamin or niacin did not raise the acetylation value, whereas administration of pantothenol brought it to very nearly the normal figure with a simultaneous relief of the subjective symptoms of burning feet. These results show for the first time, the biochemical function of pantothenic acid in humans as significantly affecting acetylation processes in the body.

As objective signs in the diagnosis of 'burning feet syndrome' were lacking, acetylation values served as a useful aid in the routine examination of this syndrome. However, a few cases have been met with, who complained of burning feet, but who had normal acetylation values and who did not improve after treatment with pantothenol. It is possible that other factors may be involved in these cases. But, by and large, acetylation values determined with a dosage

* Present address: Director, Biochemical, Laboratories, University of Madras, Madras.

of 200 mgm. of PAB should prove invaluable in detecting genuine cases of pantothenic acid deficiency among the various patients complaining of 'burning feet'. Acetylation would thus serve as a useful laboratory diagnosis in detecting cases of 'burning feet syndrome'. Treatment with sulfa drugs or an attack of malaria during the acetylation determinations have been found to vitiate the results and hence care must be taken to exclude these conditions during the test. Other conditions likely to interfere with acetylation in the laboratory diagnosis of this nutritional deficiency are under investigation and full details will be published later in the *Indian Journal of Medical Research*.

TABLE I

Percent acetylation of PAB in normal and deficient persons

Dosage of PAB	Treatment		Normal subjects		Patients with burning feet	
	Riboflavin	Phantothenol	No.	Acetylation value	No.	Acetylation value
mgm.	mgm.	mgm.				
100	..	..	11	89·5–93·8 (Ave. 91·5)	3	84·6–85·6 (Ave. 84·9)
200	..	..	8	89·7–92·4 (Ave. 91·0)	4	77·7–79·9 (Ave. 78·5)
100	125	..	1	92	1	84·2
100	..	350	1	90·7	1	87·6
200	..	350–750	2	91·6	6	86·9–90·3) (Ave. 88·8

Our thanks are due to Dr. V. N. Patwardhan, Director, Nutrition Research Laboratories, for his kind encouragement and to Hoffman-La-Roche, Basle, Switzerland, for the gift of 'Bepanthen' (Pantothenol).

1. Lipmann, F., Kaplan, Nathan, O., David G., Tuttle Constance, L. and Guirard Beverly, M., *Jour. Biol. Chem.*, 1947, **167**, 869. 2. Lipmann, F., Kaplan Nathan, O., *Ibid.*, 1946, **162**, 743. 3. —, *Federation Proc.*, 1946, **5**, 145. 4. Riggs Thomas, R. and Hegsted Mark, D., *J. Biol. Chem.*, 1948, **172**, 544. 5. Gopalan, C., *Ind. Med. Gaz.*, 1946, **81**, 23. 6. Glusman, M., *Amer. J. Med.*, 1947, **2**, 211. 7. Rubin, S. H., Cooperman, J. M., Moore, M. D., and Scheiner, J., *Nutrition*, 1948, **35**, 499. 8. Bratton, A. C. and Marshall, E. K. Jr., *J. Biol. Cyem.*, 1939, **128**, 537.

THE LIFE-HISTORY OF A TYPICAL FUNNEL CLOUD

DR. M. W. CHIPLONKAR, M.Sc., D.Sc.

TORNADOES, Waterspouts and Funnel Clouds (Elephant's Trunks) indicative of violent whirling motion in the atmosphere, are quite frequent in some parts of North America. The frequency, for instance, of destructive tornadoes is as high as a dozen per year in Kansas State in the U.S.A.[1,4,6,7] Other principal tornado regions of the world are North Africa, Southern and Western Europe, China, parts of Central Asia and Australia. In India (and in the Tropics in general)[6] it is a rare phenomenon, only few instances being on record.[3] The tornado that occurred on the 5th April 1933 at Peshawar,[8] the group of three waterspouts that were observed over the North Bay of Bengal[2] on the 14th February 1936 and the tornado cloud recently observed at Madras[5] on the 8th October 1945 are, perhaps, the only examples that have been well recorded. It is the purpose of this note to put on record one more typical instance of a Funnel Cloud that was observed by the author on the 26th June 1946 at Dum Dum (about 10 miles NE of Calcutta).

In the afternoon of 26th June 1946 the sky at Dum Dum was overcast (8-9/10ths sky covered with Cu, Fb, and Ns) and slight intermittent rain was falling; when suddenly at about 1510 hours I.S.T. the author noticed a protuberance of a very unusual form at the base of a cloud in the SW portion of the sky. It soon developed into a tube-like appendage obliquely hanging from the base of the cloud (see Plate I, Fig. 1). Even at this stage it showed a whirling motion about its axis which obviously indicated the cause of its formation. Further development then continued rapidly and simultaneously in two directions:—

(i) More and more cloud material was formed or drawn into the whirl to produce longer and longer trunk below the cloud base;

(ii) The growing trunk itself travelled bodily in a curved path.

pictures in pencil which are reproduced in Plate I, Figs. 1-6. They thus represent six successive stages (not at equal intervals of time) in the development of the phenomenon which only lasted for about 15-16 minutes. The trunk had a slate colour and

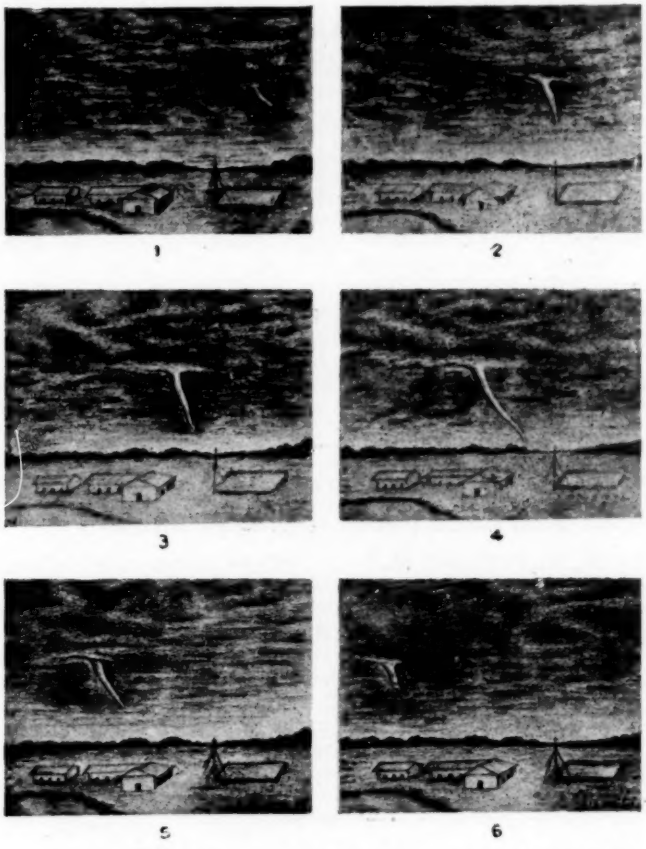


PLATE I. The Life-history of the Funnel Cloud observed on the 26th June 1946 at Dum Dum

The author had no camera to obtain a photographic record of this unusual phenomenon; and so made quickly on the spot a number of sketches in pencil as it progressed. In addition to this, careful notes were made at intervals about the phenomenon itself as also about other relevant atmospheric conditions at the place of observation. The pencil sketches were later on used to draw at leisure the six

as shown in these pictures had a very smooth and round appearance throughout. At first, it came down rather slowly up to the fourth stage (1520 hours I.S.T.) but afterwards got lifted up, shortened and vanished suddenly in the clouds above (1525 hours I.S.T.). At this time the cloud base was approximately 1·5 km. above the ground and about 9/10ths of the sky was covered with Cu, Fb and Ns. The surface wind

was light and variable, SW/S. From the observed churning movement of the cloud mass from which the trunk was hanging and also from the lively wriggling movement of the lower portion of the trunk it could easily be inferred that the whirling motion was very vigorous in the first four stages and in the fifth and the sixth stages it had slowed down considerably. The trunk, to start with, as shown by its position in Fig. 1, was nearly to the South-West and then gradually moved from there with an easterly component. It did not, however, travel in a straight line but approached the observer in the first four stages and receded from him during the later stages. When it was nearest to him about 2·5—3 miles away (Fig. 4), the lower end of the trunk was not well defined but could well be estimated to have come down to within a distance of 500–600 ft. of the ground. Of course, it never touched the ground, nor did it visibly influence any objects on the ground. As in most tornadoes, it may be noted that here also the whirling process (presumably counter-clockwise as seen from above) appears to have started high up in the atmosphere, at or above the cloud level, and gradually descended downwards as it strengthened.[3,8,9] A more detailed and quantitative discussion of this phenomenon, however, could not be taken up here as, particularly, the upper air data of (26-6-1946) for Dum Dum (or neighbourhood) are not available.

1. Brooks, C. F., *Why the Weather?*, 1935, p. 138, New York. 2. Conolly, F. C., *Report on the Administration of the India Meteorological Department* (1936-37), Frontispiece. 3. Das, A. K., *Curr. Sci.*, 1933, **1**, No. 12. 4. Humphreys, *Physics of the Air*, Third Edition, pp. 218-26. 5. Rao, D. V., *Curr. Sci.*, 1946, **15**, 71. 6. Shaw, Sir Napier, *Manual of Meteorology*, 1928, **2**, 356-62. 7. Talman, C. F., *A Book about the Weather*, 1931, pp. 158-88. 8. Veryard, R. G., *Scientific Notes, Ind. Met. Dept.*, 1934, **5**, No. 56. 9. Wegener, A., *Wind und Wasserhosen in Europa*, 1937.

OBITUARY

THE LATE PROF. M. S. SABHESAN

THE sudden death of Professor M. S. Sabhesan who, for 30 years, was in charge of the Botany Department in the Madras Christian College, is a great loss not only to that Institution but also to the whole educational world of South India.

The late Professor was no narrow specialist. His sympathies were as wide as his abilities and extended beyond text-books and curricula into the living world of men of the profession.

He was a progressive scientist and educationalist being one of the enthusiastic supporters of the South Indian Science Association founded in 1919. In espousing the cause of teachers he believed he was serving the cause of teaching and higher learning. He genuinely dedicated his spirit to the profession which he zealously followed, and has earned his blissful rest in communion with his Maker.

P. R.

Regional Scientific Bibliography for S.E. ASIA

THE UNESCO Office in South Asia proposes to compile a regional scientific bibliography to be distributed among the outside scientific world so as to increase the exchange of scientific literature from this region.

The bibliography is to be published annually with only the titles, authors' names and references to scientific publications in all branches of pure and applied sciences, including also the social, historical and educational aspects of science. Emphasis will be on original papers, books, monographs, reviews, surveys, annual reports, etc. All scientific organisations and individual scientists of this region, are invited to send such reprints, reports, etc., as are not readily available in public libraries, or at least to indicate their titles and references. A small fund is available for subscription and purchase of these publications. Postage will be refunded.

LETTERS TO THE EDITOR

PAGE

The Band Spectrum of Tantalum Oxide—I. FERNANDO AND S. G. KRISHNAMURTY 371

Ultrasonic Velocities in Mineral Acids—J. BHIMASENACHAR AND T. SESHAGIRI RAO 372

Elastic Constants of Corundum—J. BHIMASENACHAR 372

Effect of Alkali Chlorides on the Intensity of the Cyanogen Bands in Carbon Arc—P. S. MENE AND D. J. DESHMUKH .. 373

A New Reaction for the Synthesis of Chromones and Isoflavones—V. R. SATHE AND K. VENKATARAMAN 373

Effect of Penicillin on the Bacterial Contaminants of Vaccine Lymph (Calf Lymph)—V. N. KRISHNAMURTHY .. 372

Synthesis of Yohimbine and Related Ring Structures—K. K. MATHEW AND K. N. MENON 374

Note "On a Certain Distribution in the Theory of Sampling"—V. S. ANANTHACHAR 374

PAGE

The Cation Exchange Capacity of the Different Mechanical Fractions of the Soil and its Organic Matter—A. N. PATHAK, S. K. MUKERJI AND J. G. SHRIKHANDE 375

A Note on the Chromosome Numbers of Some Economic Plants of India—N. KRISHNASWAMY AND V. S. RAMAN .. 376

Some Observations on an Obscure Disease of Paddy: Oryza sativa—A. B. SARAN .. 378

Seed Setting in Kudzu Vine, Pueraria thunbergiana—P. M. DABADGHAO .. 379

An Oil-Bearing Alga from the Palana Lignite (? Eocene) of Rajputana—S. R. NARAYANA RAO AND S. S. MISRA .. 380

Coumarins as New Indicators in Acidimetry and Alkalimetry—N. M. SHAH AND L. D. DAVE 381

Vanadametry—Part IV. Volumetric Estimation of Hydroquinone by Sodium Vanadate—G. GOPALA RAO, V. BRAHMAJI RAO AND M. NARASIMHA SASTRI .. 381

Nature of Activated Sludge and its Bearing on De-Watering the Material—S. C. PILLAI 382

THE BAND SPECTRUM OF TANTALUM OXIDE

THE spectrum of tantalum oxide was photographed in the visible region by using a Littrow model spectrograph. The sources of the spectrum were high current arcs between (1) tantalum rods, (2) carbon rods stuffed with tantalum oxide, in air; and arcs between tantalum rods in oxygen. A band system extending from λ 5500 to λ 3900 was obtained. Though the heads are not very prominent, it was possible to arrange more than twenty of these bands into a Deslandre's scheme.

The system corresponds to the α-system of zirconium bands investigated by Frances Lowater. Table I presents a few of the bands at the relevant corner of the Deslandre's table.

TABLE I

v' \ v''	0	1	2
0	22639·9	21490·0	20362·3
1	23348·7	22198·8	21071·1
2	24064·9	22920·0	21776·0

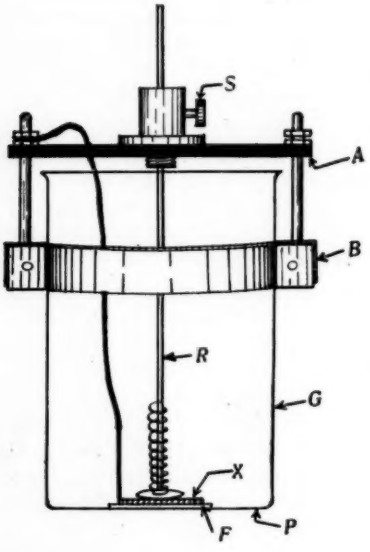
The values of W_e' (712.7), W_e'' (1161.6), $X_e'W_e'$ (1·95), $X_e''W_e''$ (5·85) compare favourably with the corresponding values for TiO, VO, CrO, MnO, ZrO, etc., molecules.

Physics Department, I. FERNANDO.
Presidency College, S. G. KRISHNAMURTY.
Madras,
September 2, 1949.

ULTRASONIC VELOCITIES IN MINERAL ACIDS

THE determination of ultrasonic velocities in mineral acids has been made difficult by the fact that the mineral acids attack the material of the crystal holder and the silvering on the piezo-crystal.

These difficulties are overcome by using a specially designed crystal holder which



consists of a pyrex glass tube G whose bottom end is closed by a flat glass plate P fused on to it. The tube is held rigidly by means of the brass clamp B attached to the ebonite insulating head A. The silvered piezo-crystal X is laid inside the tube and lightly pressed on to the plate P by means of the spring loaded rod R whose position can be fixed by the set screw S. The rod R serves as one lead for the electrical circuit and the second lead is furnished by a thin tin foil F pressed between the bottom of the crystal and the glass plate P. A drop of transformer oil between the tin foil and the glass plate provides a good acoustical path for the vibrations of the crystal to pass through the plate P. The entire assembly is held in a retort stand, provided with sufficient levelling facilities, and lowered till the glass plate P just touches the surface of the acid under investigation.

Using this crystal holder the ultrasonic velocities in hydrochloric acid, sulphuric acid and nitric acid are determined at a frequency of about 2·75 Mcs., by the Debye-Sears diffraction method. The acids used in the present investigations are ordinary bench reagents and their concentration is about 90%. The values of the ultrasonic velocities in the three acids are given below:

Ultrasonic velocities in mineral acids

Acid	Temp.	Velocity (m./s.)
Hydrochloric acid ..	25° C.	1554
Sulphuric acid ..	,,	1429
Nitric acid ..	,,	1354

Further work with pure analytical reagents is in progress and will be published elsewhere.

Dept. of Physics, J. BHIMASENACHAR.
Andhra University, T. SESHAGIRI RAO.
Waltair,
September 5, 1949.

ELASTIC CONSTANTS OF CORUNDUM

MEASUREMENTS of the elastic constants of synthetic alumina recently reported by Sundara Rao[1] were made on crystal sections of odd orientations, the constants being obtained by the sum and difference methods. Here, the elastic constants of a single crystal of naturally occurring corundum are submitted for comparison.

The author's specimen was brownish and opaque, about 1″ in diameter and 1·5″ long, and had well-developed basal plane and prism faces. Suitable sections were cut from it to determine the six constants uniquely. These values with those of Sundara Rao are given below:

Elastic Constants of Corundum

	c_{11}	c_{33}	c_{44}	c_{12}	c_{13}	c_{14}
Author ..	46·5	56·3	23·3	12·4	11·7	10·1
Sundara Rao ..	46·6	50·6	23·5	12·7	11·7	9·4

It can be seen from the table that excepting for a small difference in c_{33}, the agreement is very good.

The full details are available in the author's report to the National Institute of Sciences of India.

J. BHIMASENACHAR.

Dept. of Physics,
Andhra University, Waltair,
September 9, 1949.

1. Sundara Rao, *Proc. Ind. Acad. Sci.*, 1949, **29**, 352.

EFFECT OF ALKALI CHLORIDES ON THE INTENSITY OF THE CYANOGEN BANDS IN CARBON ARC

INTRODUCTION

THE Ga line 4172 A lies within the region of one of the systems of the CN bands which extends from 4153 A to 4216 A. The region is blackened by these bands and hence makes the detection of the Ga lines difficult. An attempt has been made to diminish the intensity of these CN bands by the addition of alkali halides to the arc.

EXPERIMENTAL

A procedure differing from that of Ashton[1] was followed. Carbon electrodes were coated with alkali chlorides by dipping them vertically in saturated solutions and evaporating to dryness. Solid adherents if any were removed by washing. The electrodes were arced for 60 seconds at 6 amperes using 220 volt D.C., through watercooled control. The arc was kept fixed at 4 mm. Pure carbon electrodes were also arced under identical conditions, and all photographs were taken with a grating spectrograph.

Band intensity measurement in the negative was carried out by a photocell and a microammeter. Due to rotational structure of the bands the intensity was averaged over a small range. Measurement of intensity gave an estimate on an arbitrary scale. The results indicate that the suppression is most effective in the case of Cs and least for Li.

Laxminarayan Institute of Technology, Nagpur,
P. S. MENE.
D. J. DESHMUKH.
September 9, 1949.

1. Ashton, *Jour. Soc. Chem. Industry*, 1949, **5**, 185.

A NEW REACTION FOR THE SYNTHESIS OF CHROMONES AND *ISO*FLAVONES

THE interaction of *o*-hydroxyphenyl benzyl ketones with ethyl orthoformate in boiling pyridine containing a little piperidine gives *iso*flavones. Thus *α*-naphthaisoflavone is obtained from 2-phenylacetyl-1-naphthol, and 7-hydroxy*iso*flavone from 2 : 4-dihydroxyphenyl benzyl ketone in excellent yields. The ethyl orthoformate condensation can also be effected in acetic anhydride and zinc chloride, but under the conditions so far examined, the yields are poor. With 2 : 4 : 6-trihydroxyphenyl benzyl ketone, ethyl orthoformate gives deeply coloured, complex condensation products. With 2-acetyl-1-naphthol, the naphthachromone is obtained, together with a bright yellow bye-product, m.p. 160°. The constitution of this compound and the mechanism of the reaction are being studied.

V. R. SATHE.
Dept. of Chemical Technology, K. VENKATARAMAN.
The University, Bombay,
October 13, 1949.

EFFECT OF PENICILLIN ON THE BACTERIAL CONTAMINANTS OF VACCINE LYMPH (CALF LYMPH)

HEAVY bacterial contamination in vaccine lymph (calf lymph) is inevitable during the process of its manufacture. None of the methods in use to bring about the reduction of its bacterial flora is satisfactory. Penicillin has recently been tried for the purpose, with spectacularly encouraging results. Our experience however in this direction has been disappointing. The use of such penicillin-treated lymphs is risky as penicillin not only does not bring about any bacterial reduction, but, what is more, gives extremely deceptive results. Most workers seem to have based their results without taking into consideration the interference of penicillin in the tests.

In one of the author's experiments on penicillin-treated lymphs, there was no growth on agar plates before removal of penicillin but after its complete removal they gave numerous organisms; the organisms are not killed but only inhibited by penicillin. Bactericidal action of penicillin is known to be maximum during the growth

phase of an organism in a nutrient medium while it is little or negligible on 'resting' organisms in non-nutrient fluids. In the vaccine lymph the organisms are in 'resting' phase in a non-nutrient medium and it is not strange that penicillin does not bring about any bacterial reduction in vaccine lymph.

V. N. KRISHNAMURTHY.

Vaccine Institute,
Bangalore City,
September 1, 1949.

SYNTHESIS OF YOHIMBINE AND RELATED RING STRUCTURES

THE recent publication by Swan[1] reporting the unsuccessful attempt to ring close 3-(2'-O-Hydroxymethyl-phenylacetamido-ethyl)-indole by heating under reflux for an hour, in an indifferent atmosphere, with phosphoryl chloride makes it necessary for us to publish this note. For some time past, one of us (Dr. K. N. Menon) has been carrying out a number of experiments to synthesise various members of the iso-quinoline and indole groups employing oxygen-alkyl substituted iso-chroman-3-one as the condensing unit. The successful development of the method has much interest in the direction of biogenesis of plant alkaloids according to Sir Robert Robinson's[2] classical theory. A large number of β-phenyl-ethylamines and iso-chroman-3-ones have been condensed and ring closed. The very heavy teaching duties of Dr. Menon has prevented more rapid progress and it is hoped grace time will be allowed to enable this laboratory to complete this work. In connection with this general scheme, synthesis in the Yohimbine group was taken up and as we had accumulated 3:4-methylene-dioxy-iso-chroman-3 one, we condensed this with tryptamine. The resulting amide gave no concrete result on treatment with phosphoryl chloride or phosphorous trichloride using benzene and its homologues as the solvent. Resinification under the action of hydrogen chloride seems to be the difficulty in this method. Using phosphorous pentoxide has given us positive results and we propose to submit the product obtained to very rigid examination before communicating the full account of this work.

The work of Jost,[3] of Karrer and Enslin[4] on corynanthein and Woodward and Mc-Lamore's[5] on the synthesis of sempervirine metho-salts by an elegantly unambiguous route, makes progress on the synthetical work we have undertaken of great interest.

Maharaja's College, K. K. MATHEW.
Ernakulam, K. N. MENON.
October 15, 1949.

1. *J. C. S.*, 1949, 1720. 2. *Ibid.*, 1917, **111**, 876; 1931, 3163; 1932, 789; 1933, 280; 1936, 1079. 3. *Helv. Chem. Acta.*, 1949, **32**, 1297. 4. *Ibid.*, 1949, **32**, 1390. 5. *J. A. C. S.*, 1949, **71**, 379.

NOTE "ON A CERTAIN DISTRIBUTION IN THE THEORY OF SAMPLING"

IT is claimed that the distribution function of the variate

$$\xi = \frac{a_1 m_1 + a_2 m_2 + \cdots + a_i m_i}{\sqrt{\{n_1 s_1^2 + \cdots + n_1 s_1^2\}}}$$

has been derived[1] without any restrictions on the constants a_i and that Simpson's theorem[2] is deducible from it as a special case.

Here, i = number of the samples drawn
n_i = size of ith sample
m_i = mean of ith sample
s_i^2 = variance of ith sample
a_i = constants.

The results and the proof given by the author are not new. Kempthorne[3] has pointed out that even Simpson's theorem is not new though the proof is interesting. Distributions of $\Sigma a_i m_i$, $\sqrt{\Sigma n_i s_i^2}$ and their ratio are available in some of the text-books on Advanced Statistics.[4,5]

Mysore, V. S. ANANTHACHAR.
July 15, 1949.

1. Krishna Sastry, K. V., "On a certain distributio n in the Theory of Sampling," *Nat. Inst. Sci. Ind.*, **12**. 8, 427-28. 2. Simpson, Harold, "On a theorem concerning sampling," *J. R. S. S.*, 1943, **36**, 266. 3. O. Kempthorne, "Comments on the previous note," *ibid.*, 1944, 58. 4. Cramer, "Random variables and Probability Distributions", *Cambridge Tracts in Mathematics and Physics*, 1937, **36**, 48. 5. Kendal, *Advanced Statistics*, 1945, **1**, Ex. 10·11, 253.

THE CATION EXCHANGE CAPACITY OF THE DIFFERENT MECHANICAL FRACTIONS OF THE SOIL AND ITS ORGANIC MATTER

As early as 1920 Ogg and Hendrick[4] showed that the fine silt and silt fractions of some Scottish soils had an appreciable capacity for cation absorption. Russell[7] on the other hand, stated that such properties of soil are connected more closely with the size of the soil particles than with their chemical composition. According to him the larger particles are so resistant as to be almost unchangeable and these chemical properties, apart from their inertness, are of minor importance compared with their physical properties. Russell's view has now been considerably modified by the recent investigations of Williams,[9] Prescott and Hosking,[6] Hosking and Piper[5] and Burvill,[3] Hosking.[2] These workers have adduced sufficient evidence to show that base exchange is not entirely a physical phenomenon but that it also depends upon the clay minerals which are also present in the coarser fractions of the soil, *viz.*, silt and fine sand. Carroll[1] examined the fine sand fractions of several of the Australian soils and recorded the presence of clay minerals in all, in some instance quite considerable amounts. The results obtained in this laboratory on a different type of soil. *viz.*. alluvial are also similar to those of the Australian workers and hence are recorded in this brief communication.

Soils from some profiles of our permanent wheat experimental plots were studied in this investigation. Results of analysis of two typical profiles are discussed here. Profiles were dug from the plot which received no manure since 1913 and others from the plot receiving annual dressings of farmyard manure. The various mechanical fractions were isolated after following the international method. Base exchange capacity was determined by Schollenberger's[8] method. Mechanical composition of the soil is recorded in Table I and the base exchange capacity in Table II.

TABLE I

Mechanical composition of the soil

	Manured			Unmanured		
Depth	0–6"	6"–1'	1'–2'	0–6"	6"–1'	1'–2'
Clay ..	13·35	21·45	29·33	13·84	20·17	26·63
Silt ..	20·10	21·90	21·22	21·54	22·50	22·88
Sand ..	66·00	55·60	47·90	63·74	56·15	48·75

TABLE II

Base exchange capacity of the various fractions in m.e. per cent. of the primary particles

	Manured			Un-manured		
Depth	0–6"	6"–1'	1'–2'	0–6"	6"–1'	1'–2'
Clay ..	33·42	26·90	31·00	28·30	30·31	31·99
Silt ..	6·80	7·10	8·70	7·70	7·50	7·40
Sand ..	1·75	2·15	2·25	1·10	1·70	1·60

The data in Table II indicate that the base exchange capacity is not restricted to the colloidal or the clay fractions. There is, of course, a sharp decline in the exchange capacities from clay to sand fractions but the amount of base these fractions can hold is appreciable and persists at almost the same level into all the layers of both the plots.

The actual base exchange capacity of the soil devoid of organic matter may be calculated from the mechanical composition in Table I and the corresponding base exchange capacities in Table II. These calculated values along with base exchange capacity of the soil and soil treated with H_2O_2 is shown in Table III.

TABLE III

Calculated base exchange capacity of the soil and different fractions free of organic matter

	Manured			Unmanured			
Depth	0–6"	6"–1'	1'–2'	0–6"	6" 1'	1'–2'
A. Untreated soil	7·40	9·60	13·50	7·00	9·20	11·50
B. From soil after oxidation of O.M. with H_2O_2	5·30	7·00	11·49	5·80	7·01	9·99
C. Clay ..	4·45	5·77	9·09	3·91	6·11	8·52
Silt ..	1·37	1·55	1·85	1·66	1·67	1·69
Sand ..	*1·15*	*1·20*	*1·08*	*0·77*	*0·95*	*0·78*
Total from primary particles	6·97	8·52	12·02	6·34	8·73	10·99
D. b.e.c. of the soil assuming clay as the only active fraction	4·48	5·77	9·09	3·91	6·11	8·52

It will be interesting to note from data in Table III that invariably the base exchange capacity as found by actual analysis (B) is

lower than the sum of the calculated base exchange capacity of the different fractions (C). This difference between the two is certainly small but significant; this may be due to interaction between the different minerals present in the silt, sand and clay lattice. Further work is in progress in this direction.

The fourth contributory factor for base exchange besides clay, silt and sand is the organic matter. Base exchange capacity of the organic matter is expressed as the difference between the base exchange before and after hydrogen peroxide treatment of the soil. When the sum of the calculated base exchange capacities of the sand, silt and clay are deducted from the base exchange capacity of the untreated soil a figure is obtained which is expressed in Table IV as the base exchange capacity calculated from the primary particles (Y). Neglecting the exchange capacities of the silt and sand, if allowance is made for the exchange capacity due to clay alone the value obtained is expressed as base exchange capacity of the organic matter assuming clay to be the other active component (Z). If the entire base exchange capacity were due to clay alone then the exchange capacity of the organic matter should have been very high, but apparently this is not the case as judged from the data in Tables IV and V.

TABLE IV

Base exchange capacity of the organic matter

	Manured			Un-manured		
Depth	0–6"	6"–1'	1'–2'	0–6"	6"–1'	1'–2'
% Organic carbon present in the soil	0·448	0·224	0·194	0·251	0·213	0·182
*% Organic matter present in the soil	0·771	0·385	0·334	0·432	0·366	0·313
X A–B	2·10	2·60	2·01	1·20	2·19	1·51
Y A–C	0·43	1·08	1·48	0·66	0·47	0·51
Z A–D	2·95	3·83	4·41	3·09	3·09	2·98

* (Organic carbon × 1·72 = Organic matter)

When items X, Y and Z in Table IV are expressed on 100 gm. organic matter as in Table V, a picture of the base exchange capacity of the soil organic matter is more clearly obtained.

TABLE V

Base exchange capacity of the soil organic matter in m.e. %

	Manured			Un-manured		
After H_2O_2 treatment ..	272	675	602	277	598	482
Assuming clay as the sole active agent	382	994	1324	715	844	952
From primary particles ..	56	281	443	152	122	163

Figures for b.e.c. for organic matter after H_2O_2 treatment of the soil and after assuming clay as the sole active agent do not conform to the values recorded by Piper,[5] Hosking[2] and others. It is only after allowing for the contribution for b.e.c. by sand, silt and clay we obtain figures shown as from primary particles in Table V which appears more correct and which also falls in line with the observation of other workers.

Our thanks are due to the U.P. University Research Grants Committee for an award of Fellowship to one of us (A.N.P.) which made this investigation possible.

Chemistry Section, Govt. Agri. College, Kanpur,
July 20, 1949.

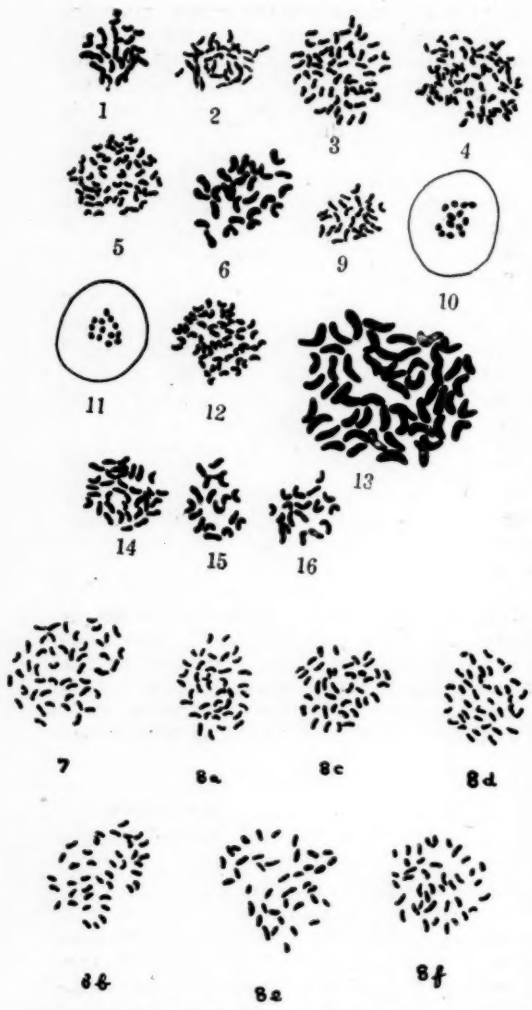
A. N. PATHAK.
S. K. MUKERJI.
J. G. SHRIKHANDE.

1. *J. Roy. Soc. W. Aust.*, 1931-2, **18**, 125. 2. *Council Sci. Ind. Res. Aust.*, 1948, **21**, 58. 3. *Trans. Roy. Soc. S. Aust.*, 1938, **62**, 366. 4. *J. Agric. Sci.*, 1920, **10**, 333. 5. *Trans. Roy. Soc. S. Aust.*, 1938, **62**, 53. 6. *Ibid.*, 1936, **60**, 35. 7. *Soil Conditions and Plant Growth*, Longman, Green and Co., London, 1932, Ed. **6**, 165. 8. *Soil Sci.*, 1930, **30**, 161. 9. *J. Agric. Sci.*, 1932, **22**, 845.

A NOTE ON THE CHROMOSOME NUMBERS OF SOME ECONOMIC PLANTS OF INDIA

As was proposed in an earlier report[1] the chromosome numbers for such economic plants of India as are not known are being determined and reported from time to time. The present one is the second of such reports. Reference is made throughout to Chromosome Atlas[2] for numbers already published and also for genera and species whose numbers remain undetermined. The genera *Garcinia* and *Mangifera* are supposed to be apomictic. The former has

Species	Common Name	$2n$ or n Number	Fig. Number	Remarks
1 Lauraceæ :—				
Persea drymifolia Cham. & Schlecht. (syn. *P. gratissima* Gaertn.)	Mexican Avacado pear	$2n=24$	1	Introduced, collected at Kallar, Nilgiris
2 Amarantaceæ :—				
Amarantus virids, Linn.	Plant of waste places, wild	$2n=34$	2	Sometimes used for spinach
3 Oxalidaceæ :—				
Averrhoa carambola, L.	The carambola fruit	$2n=24$		Country of origin is not known
4 Guttifereæ ;—				
Garcinia indica, Chois.	Kokum plant	$2n=$c. 54	3	Chromosomes small. Fruit and oil plant, Kallar
Garcinia Mangostana, Linn.	The Mangosteen	$2n=$c. 76	4	Chromosomes small Fruit plant Kallar
Garcinia speciosa, Wall	Palawa tree	$2n=$c. 55	5	Native of Burma and Andaman Islands Timber and resin.
5 Burseraceæ :—				
Commiphora Berryi, Engl.		$2n=26$	6	A small, armed tree used as hedge plant
6 Meliaceæ :—				
Swietenia Mahagoni, Linn.	The Mahogani	$2n=46$-48	7	Introduced timber and avenue tree
7 Anacardiaceæ :—				
Mangifera indica, L.	The Mango			Confirms number recorded by Janaki Ammal[2]. Progeny of single plant
var. *Nadusala*	Nadusala or Peter	$2n=40$	8*a*	12 seedlings were examined, all with same number
Inter-varietal crosses–F_1s :—				
Chinnasuwarnarekha × Panchadarakalasa		$2n=40$	8*b*	All F_1 root materials collected at Kodur Fruit Research Station
Bangalora × Baneshan		$2n=40$	8*c*	Fruit Research Station
Goa × Jehangir		$2n=40$	8*d*	Goa is polyembryonic
5/12 Neelum × Muvandan		$2n=40$	8*e*	Muvandan is polyembryonic
Interspecific crosses F_1.:—				
M. Zeylanica Hook × Rumani		$2n=40$	8*f*	*M. Zeylanica* is a wild type
8 Sapotaceæ :—				
Chrysophyllum Cainito, Linn.	The West Indian Star Apple fruit	$2n=24$		Introduced fruit plant Kallar, Niligiris
9 Oleaceæ :—				
Jasminum sambac, Ait. var. Sujimallige	Indian Jasmine	$2n=26$	9	Cultivated variety described in[3]
J. auriculatum, Vahl.	Wild	$n=13$	10	Collected near Kallar
J. malabaricum, W.	do	$n=13$	11	Collected on Marudamalali Hills, Coimbatore
J. rigidum, Zenk.	do. bushy	$2n=26$		do do at 2000 feet.
J. angustifolium, Vahl.	Wild as well as cultivated	$2n=52$	12	Root tips from garden variety collected at Coimbatore
J. calophyllum, Wall.	do do	$n=13$		Collected at Kodur. The plant resembles very closely cultivated species *J. flexile*, Vahl
10 Gramineæ :—				Confirms number recorded by Janaki Ammal[2]
Sorghum halepense, Pers.	Wild Marudamalai 3000 feet	$2n=20$		Tall, perennial growing upto 10-12 ft. height
do	do Ponnuth, near Coimbatore	$2n=20$		Similar to above.
do	form collected at Godavari	$2n=40$		Medium height, perennial awned
do	form collected at Kodur	$2n=40$		Dwarf spreading type 2-3 feet height narrow, small leaved, awnless
Pennisetum Hohenackeri	Wild	$2n=18$	15	Confirms number recorded by Janaki Ammal[2]
P. alopecuros Nees. (syn. with *P. honhenackeri* Hochst)	Wild	$2n=18$	16	Seeds from Ec. Botanist, Poona (Bombay Govt.)
P. polystachyon, Schu.	Wild	$2n=54$	13	Cultivated as fodder grass
Setaria intermedia, R & S.	Wild	$2n=36$	14	Collected at Kallar
Echinochloa stagnina, Beauv.	Wild	$n=27$		Large, perennial, culms rooting at nodes, often submerged
E. colona, Link.	Wild	$2n=48$		Paddy wet-lands, etc.



(FIGS. 1. 8*a* to 8*f*, 15 and 16—×2480; FIGS. 6, 12 and 13—× 4960; the rest ×3300.)
(FIGS. 1–6 and 9 to 16 reduced to ½ the original size.)

1. *Persea drymifolia*; 2. *A. viridis*; 3. *G. indica* 4. *G. Mangostana*; 5. *G. speciosa*; 6. *C. Berryi*; 7. *Sc Mahagony*; 8*a*. *M. indica* var. *Nadusala*, 8*b*. Chinnas. uwamarekha × Panchdharakalasa, 8*c*. Bangalora × Baneshan; 8*d*. Goa × Jehangir. 8*e*. 5/12 Neelum × Muvandan; 8*f*. *M. Zeylanica* × Rumani; 9. *J. samba*. var. *sujimallige*; 10. *J. auriculatum*; 11. *J. malabaricum*; 12. *J. angustifolium*; 13. *P. polystachyon*; 14. *S. intermedia*; 15. *P. Hohenackeri*; 16. *P. alopecuros*.

a number of fruit and timber trees. A more detailed work is being done regarding these two genera. The whole Natural Order *Burseraceæ* is lacking in the knowledge on chromosome numbers, similarly the *Combretaceæ*. A detailed work is being done in *Jasminum*. In this genus a few diploids and triploids were reported already.[3] In the following are given the plants whose numbers are now reported.

. N. KRISHNASWAMY.
Cytogenetic Lab. V. S. RAMAN.
Agricultural Res. Institute,
Coimbatore,
July 4, 1949.

1. Krishnaswamy, N., and Raman, V. S., *Madras Agri. Jour.*, 1948, **35**. 2. Darlington, C. D., and Janaki Ammal, E. K., George Allen and Unwin Ltd., 1945. 3. Krishnaswamy, N., and Raman, V. S. *Jour. Ind. Bot. Soc.*, May and August, 1948.

SOME OBSERVATIONS ON AN OBSCURE DISEASE OF PADDY: *ORYZA SATIVA*

THIS disease in Bihar is known by different local names, *viz.*, *Dakhina*, *Ukra*, *Chatra*, etc. It is a common belief here that the disease generally makes its appearance in years of high flood. The outbreak of the disease is characterised by the general yellowing of the leaves and subsequent drying up of their tips. This drying up process gradually travels downwards. Untimately the plants present a withered appearance. The yield is reduced according to the severity of the attack. In worst cases there is a complete loss of grains.

Hector[2] reported this disease from Bengal but its definite cause could not be ascertained. Wood-house[3] observed that this obscure disease is widely spread in Bihar. He further stated that it is said that with the application of *Khari Nimak* (bazar sodium sulphate) the plants revive and put up new growth. Butler[1] stated that this disease is probably due to some physiological degeneration hastened by the action of some ill-defined conditions such as climatological, soil and cultural.

In a year of high flood at the Rice Experimental area at Sabour, this disease was noticed in a few plots. One of these plots, where the plants had become yellowish and their tips had begun to wither was selected to study the effect of the following chemi-

cals on this peculiar disease. By taking 40 lb. of *Khari Nimak* per acre as standard, the rates of the various chemicals were fixed as shown below:

TABLE I

Treatments	Rate of application
A. *Khari Nimak*	40 lb. per acre
B. Sodium sulphate	40 lb. per acre (13 Na : 9 sulphur)
C. Aluminium sulphate	40 lb. per acre (9 sulphur)
D. Ammonium sulphate	37 lb. per acre (9 sulphur : 8 nitrogen)
E. Ammonium chloride	30 lb. per acre (8 nitrogen)
F. Sodium chloride	33 lb per acre (13 Na)
G. Control (No treatment)	

These chemicals were applied to the diseased crop in equal areas 5′ × 7′. The treatments were randomised and relicated twice. Within four weeks of the application of these chemicals, the beds which received treatments A,B,C and D became green and had put up new growth. A couple of weeks later these beds showed no sign of the disease. Treatments E and F, however, showed some gradual improvement, which never reached a stage of complete recovery.

At maturity all the beds were separately harvested. The results obtained are stated below:

Treatment	Average yield per acre in lb.	% increase on control
A. *Khari Nimak* ..	1726	194·5
B. Sodium sulphate ..	1678	189·1
C. Aluminium sulphate	1505	169·6
D. Ammonium sulphate	1701	191·7
E. Ammonium chloride	1041	117·3
F. Sodium chloride ..	1002	112·9
G. Control ..	887	100·0

From the above statement it may be seen that *Khari Nimak*, ammonium sulphate, sodium sulphate, aluminium sulphate have given fairly good results—giving an increased yield of 94·5, 91·7, 89·1 and 69.6% respectively. Out of these treatments *Khari Nimak* has given the best result. Ammonium sulphate, however, has given the next best performance in yield. Ammonium chloride and sodium chloride have also given an increase of 17·3 and 12·9% in the grain yield respectively. When the results of the treatments A,B,C and D are examined in comparison with that of E and F it appears that perhaps sulphates in the treatments A, B, C and D have something to do with the increased yield obtained with these treatments. It is with these treatments, as already stated, the plants had completely shaken off the symptoms of the disease. The soil analysis of the diseased plots has given an indication of sulphate deficiency. Diseased plant materials were examined for fungi, insects and eelworms, but nothing discriminating was found that could be held responsible for the symptoms.

Incidentally it may be mentioned that the diseased plants when uprooted and replanted in a disease-free plot quickly improved and shook off all signs of the disease, whereas those which were replanted in a diseased plot rapidly deteriorated.

Experiments to introduce this disease artificially by creating sulphate deficiency in the culture medium is in progress.

Bihar Agri. College, Sabour (Bhagalpur), *July* 29, 1949. A. B. SARAN.

1. Butler, E. J., "The cultivation of rice in Spain and the recent international Rice Congress at Valencia", *Agri. Jour. of India*, 1914, 9. 2. Hector, G. P., "*Ufra* disease of rice" *Dep. of Agri. Bengal Bull.*, No. 2. 3. Woodhouse, E. J., "Crop pest hand-book for Bihar and Orissa, 1913.

SEED SETTING IN KUDZU VINE, *PUERARIA THUNBERGIANA*

KUDZU VINE (*Pueraria thungergiana*) is assuming an increasing importance in the soil conservation programme as an effective soil binder; it also affords high bulk of very nutritious forage for the livestock. Its propagation on extensive scale has been handicapped due to its absence or poor seed setting ability.

Systematic work, carried out at Poona, to induce flowering in this species has proved inconclusive.[1] The only other record where the kudzu vine has flowered was at Pusa where the flowering was recorded by Joshi even in the first year.[2]

This vina has been under observation in the Agrostology Section of the Division of Agronomy, Indian Agricultural Research Institute, New Delhi. A single plant received from Mr. N. V. Joshi, Poona, was planted in Mid. Block A3 on 18-10-'45. The growth was affected by frost during December, but

fresh growth was observed in the last week of January. The vine was manured with 4 oz. of ammonium phosphate on 16-1-'46; no manuring was done subsequently. Since then the vine has spread profusely; it suffers heavily due to frost in winter and puts on vigorous growth in spring.

For the first time flowering was observed on 8-9-'48, *i.e.*, about three years after planting. Flowering was moderate and was observed on north-east to south-east aspect only. Shedding of flower was a rule, original purple colour turning into bluish after shedding. Natural pod formation was detected on 20-9-'48 on a shoot that happened to climb on a wire fence post. This pod was unfortunately found missing.

In order to understand the general failure of the effective pollination, the carpel was examined and it was found that the stigmatic surface was hard. Flowers on four separate inflorescences were pollinated artificially on 23-9-'48. One pod was observed on each of the two inflorescences so treated. The mature pods were small and contained only one seed each.

The vine remained dormant during winter months and started spring growth in February, 1949. Flowering was observed on 20-4-'49 and natural pod formation occurred by 1st week of July. There was considerable shedding of flowers as last year but the number of pods formed this year is about 8-10.

The formation of flowers and rods after the third year is in conformity with the recorded observations in U.S.A.[3], where the seed formation in kudzu was found to be best in vines of over three years of age, climbing on small to medium-sized trees, in permanent pastures with deep soils.

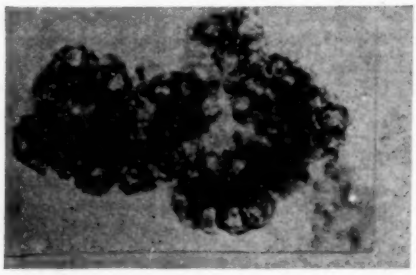
My thanks are due to Dr. J. N. Mukherjee and Dr. T. J. Mirchandani for kind encouragement.

P. M. Dabadghao.
Indian Agri. Research Institute,
New Delhi,
August 12, 1949.

1. N. V. Joshi, "Annual Report, 1945-46 on I. C. A R., Scheme for the Cultivation and Distribution and for Investigation of Condition of Flowering and Setting Seed of Kudzu Vine" (unpublished). 2. —, "Kudzu vine (*Pueraria thunbergiana*), *Agric. and Live stock in Ind.*, 1933, **3**, 586-92. 3. Paul Tabor, "Seed Production by Kudzu (*P. thunbergiana*) in the South Eastern United States during, 1941," *Jour. of the American Society of Agro.*, 1942, **34-4**, 389.

AN OIL-BEARING ALGA FROM THE PALANA LIGNITE (? EOCENE) OF RAJPUTANA

The theory of the algal origin of bog-heads was first advanced by Bertrand and Renault[1] in 1892: the 'yellow bodies' of the Permian kerosene shales of New South Wales were described by them as remains of a microscopic alga, *Reinschia australis*; almost similar organisms found in the Carboniferous bog-heads of Scotland were also considered to be algæ, a species of *Pila*. The algal nature of bog-heads was later questioned by Jeffrey[2] who considered that the 'yellow bodies' were spores of higher plants. Later work by Thiessen,[3] Zalessky,[4] Blackburn and Temperley[5] demonstrated that the bog-head fossils are algæ differing but little from the living species *Botryococcus braunii*,[6] a colonial alga found in fresh and brackish waters. *Botryococcus* and its palæozoic allies, contain considerable oil and their sapropelic accumulations have given rise to bog-heads and other forms of bituminous coal. An ill-preserved yellow oil-bearing alga has been recorded by Down and Himus[7] from the Eocene Kohat oil-shales; and more recently Lahiri[8] has described supposed algal structures from the kerosene shales of the Saline series whose age is still a matter of controversy.



Botryococcus (?) sp. ×460. From lignite (? Eocene) Palana, Rajputana.

This note records the presence of oil-bearing yellow bodies similar to *Botryococcus braunii*, in a lignite from Palana,

near Bikaner. The bed of lignite which varies in thickness from a few inches up to 8 feet is overlain by a thick bed of Nummulitic Limestone. Lignite samples and the Nummulitic limestones were collected by S. S. Misra in 1948 from a section at Palana described by La Touche.[9] The bed of Nummulitic limestone contains *Assilina spinosa* and *A. daviesi*, but *A. granulosa* is, however, not present. The Palana Limestone correlates with the Bhadrar beds, the highest Laki beds of the Salt Range and the underlying lignite is also probably Eocene in age, but no marine organisms were noticed. The lignite is made of lumps of resin, carbonised wood, cuticles, and spore exines (which are being studied by Dr. A. R. Rao).

A specimen of the alga recovered from macerations is shown in the accompanying photo. Each colony is more or less spherical in form with a central cavity surrounded by a zone of cells. Usually several colonies coalesce into a compound colony. The alga is oily-looking light yellow in colour, (a few are greenish), well-preserved and resembling *Botryococcus braunii* in structure and dimenions.

A detailed account of the Palana alga will be published elsewhere.

S. R. Narayana Rao,
Dept. of Geology, S. S. Misra,
University of Lucknow,
Lucknow, *September* 8, 1949.

1. Bertrand and Renault, *Bull. Soc. Hist. Nat. Autun.*, 1892, **5**. 2. Jeffrey, *Proc. Amer. Acad. Arts. & Sci.*, 1910, **46**. 3. Thiessen, *U. S. Geol. Surv. Prof. Paper*, 1925, **132**, 1. 4. Zalessky, *Rev. Gen. Bot.*, Paris, 1926, **38**. 5. Blackburn and Temperley, *Trans. Roy. Soc. Edin.*, 1936, **58**, 3. 6. *Eælophyton* Thiessen is considered by Pia (in Hirmer, *Handbuch der Palæobotanik*, 1927) to be identical with this genus. 7. Down and Himus, *Jour. Inst. Petr.*, 1940, **26**. 8. Lahiri, A., *Proc. Nat. Acad. Sci.*, 1944, **14**, 6. 9. La Touche, *Rec. Geol. Surv. Ind.*, 1897, **30**, 3.

COUMARINS AS NEW INDICATORS IN ACIDIMETRY AND ALKALIMETRY

Hydroxy-coumarins undergo colour changes at different pH values, *e. g.*, 5-hydroxy-coumarins in alkaline solution[1] turn yellow, the colour being discharged on acidification: similarly, 7-hydroxy-coumarins exhibit blue fluorescence, which disappears on adding acid.

5-Hydroxy-6-acetyl-4-methyl coumarin[2] has been selected for investigating its use as an indicator. Alkalimetry turns it deep yellow, while it remains colourless in acids. Its 0·1 per cent. alcoholic solution has been used throughout this work. Various acids, and alkalies (HCl, H_2SO_4, HNO_3, succinic acid NaOH, KOH, Na_2CO_3) were titrated using the above solution as an internal indicator, two to three drops being added. The change in the colour of indicator was quite sharp. In all the titrations 5-hydroxy-6-acetyl-4-methyl-coumarin as an indicator gave results closely analogous to those for phenolphthalein.

Further work on the utilisation of other 5-hydroxy-as well as 7-hydroxy-coumarin derivatives is in progress.

N. M. Shah.
M. R. Science Institute, L. D. Dave.
Gujarat College, Ahmedabad, and
Vithalbhai Patel Mahavidyalaya,
Vallabha Vidya Nagar, Anand,
August 10, 1949.

1. Collie and Chrystall, *J.*, 1907, 1804; Dey, *J.*, 1915, 1614, 1621. 2. Sethna, Shah and Shah, *J.*, 1938, 231.

VANADAMETRY—PART IV

Volumetric Estimation of Hydroquinone by Sodium Vanadate

In the reaction between hydroquinone and sodium vanadate, diphenyl benzidine serves as an excellent indicator at 50° C. in presence of oxalic acid as catalyst. 10·0 ml. of 0·05 M hydroquinone solution were taken and diluted to about 150 ml. followed by the addition of 5 ml. of 15 N sulphuric acid and 1·0 ml. of 0·1% indicator. To the mixture at 60° C., a known quantity of oxalic acid added. Then an equivalent Volume of 0.05 N vanadate solution (with a drop in excess) was added with brisk stirring and the time taken for the appearance of the blue-violet colour was noted. Experiments were carried out, varying the concentration of oxalic acid. The results are recorded in Table I.

The data show that diphenyl benzidine serves as a good indicator in the presence of oxalic acid at or above a concentration of 0·01N. We have also found that the end point will be sharply indicated when the overall concentration of hydroquinone

TABLE I

Volume of 1·0 N oxalic acid	Nil	0·25 ml.	0·5 ml.	0·75 ml.	1·00 ml.	1·5 ml	2·00 ml.	3·00 ml
Time of first appearance of blue-violet colour in the cold	No colour even after 10 minutes	45 sec.	45 sec.	42 sec.	40 sec.	35 sec	30 sec.	30 sec.
Time of first appearance of blue-violet colour at 60° C.	Very faint blue-violet colour after 8 minutes	5 sec.	5 sec.	4 sec.	4 sec.	3 sec.	3 sec.	3 sec.

is under M/100 and the acid concentration is over 1.0 N. The results in Table II show that the vanadametric method gives results in agreement with the ceric sulphate method.[1]

TABLE II

No.	Amount of hydroquinone in milligram mols. By weight	Ceric sulphate method	Vanadametric method
1	0·5000	0·4982	0·4994
2	0·4000	0·3980	0·3986
3	0·3653	0·3640	0·3638
4	0·3000	0·2989	0·2993
5	0·7306	0·7275	0·7290
6	0·5480	0·5466	0·5465

Although ceric sulphate is a convenient reagent for the estimation of hydroquinone, it is unsuitable for use in the presence of phenolic compounds, since it oxidises these phenols to coloured substances insoluble in sulphuric acid. We have now found that sodium vanadate gives accurate results even in the presence of phenol, *ortho*-cresol, *meta*-cresol and *para*-cresol, (Table III).

TABLE III

Phenolic compound added in milligram mols.		By weight	By vanadametric method
Phenol ..	2·5040	0·3653	0·3638
	5·0080	0·3653	0·3638
	10·0160	0·3653	0·3638
Ortho-cresol	5·000	0·3653	0·3638
	10·000	0·3653	0·3638
Meta-cresol	4·6660	0·3653	0·3638
	9·3230	0·3653	0·3638
Para-cresol	2·5040	0·5480	0·5465
	5·0080	0·5480	0·5465
	10·0160	0·5480	0·5465

Resorcinol, however, undergoes induced oxidation by sodium vanadate in the presence of hydroquinone giving a deep coloured substance.

Andhra University, Waltair, and Mrs. A.V.N. College, Visakhapatnam,
G. GOPALA RAO.
V. BRAHMAJI RAO.
M. NARASIMHA SASTRI.

August 22, 1949.

1. Furman and Wallace, *J. Am. Chem. Soc.*, 1930, **52**, 1443.

NATURE OF ACTIVATED SLUDGE AND ITS BEARING ON DE-WATERING THE MATERIAL

ACTIVATED sludge derives its activity from its organisms of which the most important are certain ciliates, more especially *Epistylis* sp. and other *Vorticellids*. The protozoa occur abundantly, forming slimy growths tenaciously attaching to the sides of aeration tanks and other fixed and mobile surfaces, *e.g.*, microscopic particles of more resistant forms of organic matter in the mixed liquor (Figs. 1-2). Colonial *Vorticellids* were found most efficient in "floc" and sludge formation. These organisms are sensitive to acids, alkalis and other chemicals in concentrations met with in certain trade effluents, and are readily stained by carbol fuchsin.

The protozoal growth (*Epistylis* sp.) when washed and suspended in H_2O, presents a fairly white, fluffy, mucus-like appearance and settles down rapidly and forms a compact gelatinous mass which, under anaerobic conditions, putrefies; when aerated, nitrifies forming a brownish deposit; and on oven drying, yields, a dark brown powder.

Unlike other types of sewage sludges, activated sludge is bulky, hydrophilic and richer in nitrogen. These properties are

FIG. 1. Photomicrograph of the protozoal growth (*Epistylis* sp.) occurring on the sides of the aeration tanks of the Activated Sludge Plant at the Indian Institute of Science, Bangalore. ×60.

FIG. 2. Photomicrograph of an actively developing "floc" of activated sludge showing the growth of different species of *Epistylis* and *Vorticella* on a particle of sewage matter which acts as a suitable nidus. × 60.

influenced by protozoal development, as seen below:—

	A thick culture of *Epistylis* sp. (the protozoal growth collected from the sides of aeration tanks and repeatedly washed in H_2O)	Thick activated sludge (by allowing mixed liquor from the aeration tanks to settle)*
Weight of the material taken ..	5·2 gm.	5·2 gm.
Volume occupied	10 c.c.	5 c.c.
Number of active *Epistylis* sp. ..	650,000	200,000
Dry weight (oven dry)† ..	0·29 gm.	0·30 gm.

* At the same time, one litre of the original mixed liquor was filtered through filter-paper (No. 41) and the filtered material was dried in the oven, the weight of the dry matter being 1·93 gm.

† A comparative study of the rates of drying of the two materials revealed that that the protozoal material dried more slowly. The protozoal powder on analysis had the following percentages ;—

Loss on ignition—96·5 ; Nitrogen—9·9 ; P_2O_5—1·3; successive extractions with ether, alcohol and chloroform—10·8, 23·6 and 0·2 (respective extracts).

The above and earlier observations [1,2] show (1) that the attached forms of protozoa are better adapted to function as a biological flocculant in the activated sludge process; (2) that the colour, composition and activity of the sludge are mostly derived from the protozoa in the sludge; and (3) that the main difficulty in de-watering the sludge is due to the presence of protozoa and other forms of life.

Thanks are due to Prof. V. Subrahmanyan, Dr. Gilbert J. Fowler and Mr. B. N. Banerjee for their interest; and to Dr B. R. Seshachar for assistance in taking the photomicrographs.

S. C. PILLAI.

Department of Biochemistry,
Indian Institute of Science,
Bangalore,
July 23, 1949.

1. Pillai, S. C., *Curr. Sci.*, 1941, **10**, 84; *ibid.*, 1942, **11**, 437. 2. Pillai, S. C., and Subrahmanyan, V., *Nature* 1942, **150**, 525, *ibid.*, 1944, **154**, 179; *Sci. and Culture*, 1945, **11**, 75.

REVIEWS

Living Mathematics. By R. S. Underwood and Fred. W. Sparks. (McGraw-Hill Book Company, Inc.), 1949. Pp. x + 374. Price $ 4·00.

This is the revised second edition of a book which was first published in 1940. It is not a book for the high-brow and by *Living Mathematics* the authors do not mean any of the rapidly growing branches of modern mathematics such as abstract algebra and topology. The treatment is split into two parts of which the first contains exersises of the matriculation standard while the second, though advanced, falls short of the intermediate requirements. The subjects touched in the book are arithmetic, algebra, trigonometry, calculus and analytical geometry. The last chapter of the book is called *Extended Analytical Geometry—A New Field of Mathematics.* It is elementary and at the same time both novel and stimulating. The young student for whom the book is intended will find its value increased by the tables given at the end and by the special treatment of certain topics such as annuities. The style is a bit too lively for the immature 'teener' and the interesting historical references and witty remarks, which vitalize the book, will be more appreciated by mature minds with an amateurish predilection for mathematics. But one danger of all such mixtures of words and symbols is that those who ought to be attracted by words are repelled by symbols while those for whom the symbolic operations are carried out find the running commentary brilliant but unhelpful. The book under review has been received well by the public in America and it will indeed be fortunate if we find in our country "businessmen, lawyers, doctors, painters and second-storymen who plead guilty to a mathematical flair" and who would read *Living Mathematics* with zest. At any rate the book can be read with interest and profit by many, particularly, in the training colleges for teachers.

It is in the best traditions of the McGraw-Hill Book Company that we find the printing and get-up of this book, and also the price. Many years ago, Stephen Leacock made fun of the ascetic simplicity of mathematical books. The colourful jacket of this book agreeably proclaims the arrival of the new æsthetic spirit in the mathematicians' camp.

V. V. N.

Solid Analytical Geometry. By Adrian Albert. (McGraw-Hill Book Co.), 1949. Pp. 162. Price $ 3·00.

This forms an introductory course dealing with the equations of the straight line, plane and quadric surfaces. The treatment is lucid and refreshing, with a rigorous algebraical background for the introduction of co-ordinates, and the equations, of the curves and surfaces considered. One chapter is devoted to the study of the elementary properties of matrices and determinants and after introducing the matrices relating to orthogonal transformations and rotations about the coordinate axes, the reduction and classification of the quadrics and their "points and planes of symmetry" are discussed. The last chapter introduces homogeneous coordinates and the fundamentals of projective geometry. The last but one chapter dealing with "spherical coordinates" is an unusual feature. The commonly-called polar coordinates are called respectively *range*, *azimuth* and *elevation*, and are collectively designated as spherical coordinates. Rotations about the three axes of coordinates are respectively called *pitch*, *roll* and *yaw*, and their associated matrices are given. The chapter ends with the formulæ relating to gnomonic projections, and the idea of gnomonic charts.

A laudable though short work on geometry by a well-known algebraist, the book will receive the appreciation of algebraists as well as orthodox geometers.

C. N. S.

The Real Projective Plane. By H. S. M. Coxeter. (McGraw-Hill Book Company), 1949. Pp. 196. $ 3·00.

This book presents the subject-matter of synthetic projective geometry in a very lucid and simple manner, developing the subject by a carefully chosen set of axioms of incidence and order. The development of the subject is primarily based on Von Staudt's definitions of projectivity and the conic. A projectivity between two ranges is a correspondence that transforms a harmonic set into a harmonic set. An involutary correlation or point-line correspondence is called a polarity and a conic is the locus of points that lie on their polars, or the envelope of lines that pass through their poles. The equivalence of these definitions with Poncelet's definition

of projectivity and Steiner's definition of a conic is worked out in a very elegant manner. There is a chapter dealing with "generalized projectivity" on a conic, and with the theorem that any projectivity on a conic determines a collineation of the whole plane. There are two brief chapters giving the fundamental ideas of affine geometry, which is projective geometry minus the line at infinity and Euclidean geometry which is affine geometry possessing an orthogonal involution. A list of properties of conics which can be considered as affine properties is worked out and properties of circles and some properties of conics are developed by the above conception of Euclidean geometry. The latter chapter fittingly ends with the proof of the focus-directrix property of a conic. In the last two chapters, "Analytical Geometry" is introduced in terms of the axioms and concepts of synthetic geometry, and is comparable to similar treatment in Veblen and Young's *Projective Geometry*.

The handy size of the book makes it a convenient text-book for explaining the fundamental concepts of synthetic geometry, after which the student can proceed to the vast sea of geometrical properties of the conic sections in other books wherein the methods of projective and metrical geometries are freely mixed up.

C. N. S.

Monomers, Section I. Edited by E. R. Blout, W. P. Hohenstein and H. Mark. (Interscience Publishers, Inc., New York, N. Y.), 1949. Price $ 7·50.

This is a folder type volume of unbound fascicles, each containing anywhere from 30 to 60 pages and dealing with one of the following monomers : acrylonitrile, butadiene, isobutylene, isoprene, methyl methacrylate, styrene, vinyl acetate and vinyl chloride. All these substances, capable of addition polymerisation, have not only been employed in the study of the fundamental chraracteristics of the processes leading to the formation of high polymeric materials but are being utilised for the industrial production of fibres, plastics and rubbers of great technical value and practical utility.

Each monomer is presented, after a short introduction, under the following sub-divisions: methods of preparation in the laboratory and on industrial scale, the most convenient and economical methods being indicated; purification and analysis according to the best procedures available; precautions in the handling and transportation of the material; physical properties with accurate quantitative data and graphs; pertinent chemical reactions the monomer can undergo alone and with other substances, and polymerisation under various, experimental conditions of temperature, pressure or concentration, reaction medium, catalyst, etc. There is a table of contents at the beginning and a list of literature references at the end of the section.

All the chapters have been written by the research workers of the Institute of Polymer Research, Brooklyn Polytechnic Institute directed by Prof. H. Mark, except the chapter on methyl methacrylate which is by Dr. Corley of Polaroid Corporation, Cambridge, Mass. Accuracy and thoroughness of treatment of the subjects are guaranteed by the fact that most of these monomers have been investigated at the Institute itself. The authors have drawn freely not only from the information gathered at the Institute but also from the published scientific and technical literature and data supplied by industrial concerns. Little needs to be said about the editorial board headed, evidently, by Prof. Mark, an internationally recognised authority in the field of high polymer research and industrial practice, who is also editing, with others, a loose-leaf literature and patent service on Resins-Rubbers-Plastics and on Natural and Synthetic Fibres.

The purity of the monomer is of the utmost importance in addition polymerisation which is a chain process very sensitive to the presence of impurities which may act either as retarders or as negative catalysts. The information presented in this volume on monomers of scientific and industrial value will be welcomed not only by the research worker in the laboratory but also by the production engineer in industry. The volume will be particularly appreciated by research workers in India who have to prepare the monomers for themselves since they are not easily available.

No typographical or factual errors have been noticed, and the printing is of the excellent standard generally associated with Interscience publications. By way of information to prospective buyers, it may be added that articles on additional monomers (acrylic acid, esters of acrylic acid and esters of methyl methacrylic acid other than methyl methacrylate) now in active preparation and on others which may soon find place in industrial practice, may be conveniently added in the folder of the present volume and may be obtained as soon as they are published provided a standing order is

placed for them at the time of purchasing the present volume.

L. M. YEDDANAPALLI.

Tablet Making. By Arthur Little and K. A. Mitchell. Published by the Northern Publishing Co., Ltd., 37, Victoria Street, Liverpool, 1. 1949. Pp. 121 with 41 illustrations. Price 15*sh*.

During the last five or six years one is accustomed to come across frequently a new facile American expression, "The technical know-how". This expression really means a knowledge of the minutiæ of process operations in a factory both from the point of view of theory and practice The book under review, "Tablet Making" can truly be described as furnishing the technical know-how of all varieties of tablet making. A "high-brow" theoretical scientist may cynically lay aside this book as merely a compendium of catalogues of tablet-making machinery under the guise of a descriptive and practical text-book. We can conveniently ignore such critics and welcome this publication. That modicum of theoretical science necessary to serve as a background in the practice and art of tablet-making has been provided. Necessarily the mechanical and chemical engineering aspects of the industry have been given greater and detailed attention.

The various operations connected with tablet making like mixing, wet-granulation, drying, dry-granulation, lubrication, compressing, colouring and coating of tablets, etc., all have been dealt with lucidly and adequately. Since the use of tablets in confectionery, pharmaceutical and other trades has become enormous and since complicated "multi-punch" rotary tablet machines have come into use, complete details of the operations and care of such machines have been given. There are rotary tablet-making machines, for example, with ½-inch tablets, to produce 500 per minute or 30,000 tablets per hour, uniform in size and weight! None the less, even to-day, there is a need for hand tablet making in small establishments and this aspect has also received attention. A very useful part of the book is a chapter dealing with processing of various chemicals giving twenty-five examples of tablets with their component ingredients.

Having described the essential points regarding the manufacture of tablets, the authors take, as an illustration, the preparation of an Iodised Throat tablet (p. 36). Its manufacture is described in detail. This has been well done.

Take another example, "Wet granulation". Authors state as follows:—

"Looking back to the earlier days in the granulating room with the slow moving process of hand granulation and then to witness the speedy businesslike performance of the present-day oscillating granulator, one is compelled to pay tribute to the chemical engineering industry for this contribution to the problem of speeding up production and eliminating the drudgery from the granulation process..... The end of the day in the past found operators with aching arms and a feeling of boredom with the drudgery of the process... Times have changed. The modern oscillating granulator has revolutionised the granulating process. The batch which took two people hours to granulate in the old days now can be processed in anything from 20 to 30 minutes. A machine can be operated by a junior who merely presses the starting button and feeds in the moist material gradually. The result is perfect granulation by mechanical means in approximately one-fifth of the time. The advantage to the manufacturer in reduced overheads is obvious. The advantage to the worker both physical and mental can be appreciated by any person who experienced the old methods."

The pharmaceutical industry specially welcomes this book. The illustrations are all from one source. There is nothing wrong in this, but other sources of supply of mechanical equipment might have received some attention. For example, recently, claims have been put forward that the Jackson-Crokatt No. 4 granulator, starting with moist or sticky powders, will have an output four to five times that of any other granulator. Some advances have been made in "infra-red-ray drying". Probably no mention has been made since it does not yet find general acceptance in the trade.

The book is well printed and bound. The illustrations are clear and well chosen. But the price is rather on the high side.

S. G. SASTRY.

Annual Review of Physiology, Volume IX. (Published by the Annual Review Inc., & the American Physiological Society), 1949. Pp. vii+643. Price $ 6·00.

The present volume is a select and critical record of the latest advances in several branches of physiology, and maintains its usual high standard. Exhaustive bibliography given under each subject adds to the usefulness of the Review.

Limiting itself to classical physiology, certain chapters, included in previous issues (*e.g.*, exercise, anoxia, etc.) have been omitted. All contributors have recognised the role of physiology as a co-ordinator and interpretor of the living organism in health and disease, and accordingly its scope has been enlarged, and sciences often previously separated have been fused. Developmental physiology, by Schechtman deals with the physiology of embryonic differentiation. Certain topics, such as histochemistry of the ovary, enzymes and reproductive control have been touched on in the review on "Reproduction", by Catchpole. The discussion on the metabolic function of the endocrine system by Barker includes the recent development in the mechanism of hormonal effects. Insulin and carbohydrate metabolism, hormonal effects on phosphatases and arginase and studies on thyroid, pancreas, and adrenal and pituitary have been presented in detail. A survey of the pertinent literature on visceral and somatic functions of nervous system, bioelectric potentials in nervous system and muscle shows that a great deal of interest has been shown in these fields. Several useful reviews of the various aspects of the "Electrical Activity of the Brain" have appeared and the survey by Walter and Walter reflects a widening prospect of more fertile field. The 'Physiological Psychology' is the subject of an extremely interesting review by Harlow. The reviewer has surveyed the relevant physiological facts and theories and has given a systematic orientation to the study of psychophysiology. Alexander Sandow has mainly dealt with the fundamental problem of the contraction of skeletal muscles and the topic has been brought up to date in his review of the subject 'Muscle".

The reviews of the cardiovascular system under the headings "Hæmatopoiesis", "Heart", "Peripheral Circulation" and "Lymphatic System" are critical and comprehensive, and present a clear picture especially with respect to anæmia and indicate the future line of investigation. Wyss has covered only the external or somatic respiration, particularly lung-breathing, in his article on "Respiration," and the effects of respiratory and other gases on the body tissues and organs have been purposely omitted. The clinical application of anoxia and mechanical effects of barometric pressure have only been briefly mentioned. The review on "Kidney" by Philips covers mainly the renal function — from fœtal life through infancy, discussion on renal blood flow, glomerular filtration and experimental induction of renal damage and its treatment.

Considerable interest is shown in biochemical and physiological research with the help of radioactive isotopes. Nims has reviewed the action of ionising radiation on living cells and has discussed the subject of whole body radiation and its effect on blood and hæmopoiesis, skin and other tissues. From the work done so far in radiobiology, it is evident that greatest advances will come, not from the use of isotopes as source of internal radiation, but from the employment of tracer techniques for understanding physiological disturbances and pathological processes. Nims has not attempted to cover the whole field but only touches the highlights in a highly suggestive and critical chapter on 'Radiation'. Teorell has reviewed the field of biological permeability. The physical chemistry of permeability and the cell and tissue permeability have also been referred to. Recent advances in pharmacology, physiology of hearing, vision, liver and digestive system are also included in this volume.

The *Annual* will commend itself to all investigators interested in the critical appraisal of the progress of physiology in its most comprehensive sense, and will prove indispensable not only to physiologists but also to those engaged in medical research.

N. N. De.

Selected Topics from Organic Chemistry. By Karve, D. D. and Advani. Publishers: M/s. Dastane Brothers, Poona 2), 1947. Pp. vi×418 Price Rs. 10.

In this concise volume the authors have presented the salient features of many important topics in Organic Chemistry, chiefly from the standpoint of University Examintions of the Pass and Honours degrees of Indian Universities. Generally speaking, the treatment falls considerably short of the Honours standards. But if the less important chapters (24, 25, 27, 28 and 31) could be replaced by more important ones the book might perhaps be brought up to the level of the "Recent Advances" series by Glasstone and others.

The chapter on carbohydrates confines itself chiefly to the chemistry of glucose and fructose, the disaccharides being considered only in outline, while the polysaccharides are entirely omitted. Considering the importance at present of the production of organic chemicals by micro-organisms, a brief account at least of the manufacture of acetone, butyl alcohol, lactic acid, citric acid, gluconic acid, sorbose, etc., should have found a place in the chapter

on Fermentation and Enzyme action. Baeyer's Strain Theory has not received adequate treatment under Polymethylenes, particularly its limitations. Ruzicka's work on civetone and muscone could have been given in some detail as confirming Sachse and Mohr's theory of strainless rings.

Only a few terpenes regarded as important from the examination point of view have received attention. The interrelationship of carvone, terpineol and dipentene and their interconversion might have been indicated. Synthesis of terpenylic acid is better located on p. 62 than on p. 71. Synthetic substitutes of rubber deserve ampler treatment. The recent synthesis of nicotine is an unfortunate omission. There is a tendency to omit the names of chemists responsible for partial or total synthesis (Robinson's *Synthesis of Tropine*, p. 114, for example). It is gratifying to note that the recent synthesis of quinine by Woodward and Doering has found a place though the names of the authors have been omitted. Flavones, flavonols and anthocyanins form a natural group on account of their close relationship. The chapters on dyes and, colour and constitution could go together. The chemistry of indigo should have been discussed at greater length giving the latest developments in manufacture and its use at present in the solubilised form. The newer method of manufacturing anthraquinone from o-benzoyl benzoic acid dispensing with anthracene as raw material might have been given. The chapter on drugs is good but a more detailed account of the sulfa drugs is necessary. Vitamins and hormones have been dealt with rather briefly. Students would appreciate a clear and lucid account of the theory of resonance and its applications in structural organic chemistry. The chapter on physical properties and chemical constitution may be restricted to such properties as are applied at present for solving problems of chemical constitution, with mention of specific cases where they have been of help in deciding chemical constitution. Electronic interpretations of some of the reactions or later ideas of reaction mechanisms should have been indicated in the chapter on condensations and other reactions.

On the whole, the authors have given as many useful facts as possible under each topic, to make it useful from the standpoint of examinations, but the more enterprising class of students would appreciate a fuller treatment. References to literature would enhance the value of the book and the errata list which is really too long will no doubt be reduced to the minimum in the next edition. M. V. S.

Botulinum Bacilli and Their Occurrence in Sweden. By John Fahraes, Stockholm. 1949.

This beautifully got up monogram on Botulinum bacillus gives an exhaustive review of the subject since its discovery by Ermengem. One interesting feature of various strains, A, B, C, D, E, etc., is that their biochemical activity such as carbohydrate fermentation and proteolytic activity is a function of the locality of occurrence. The organism is anaerobic, spore-forming gram-positive bacillus, the spores being highly heat resistant. The pathogenicity is due to toxin whose maximum titre was obtained in peptone broth or in coagulated protein and peptone at 25-30° C. The toxine is heat labile, acid resistant but sensitive to alkali, therefore is absorbed in the stomach and duodenum when ingested. Chickens, pigeons, cats, rabbits and guinea pigs are found to be sensitive to it. Chickens have been found to become paralysed and dying from consumption of food remains which have caused human intoxication. The organism has been isolated from the intestinal contents of birds dying botulinum. The toxic effect is most marked in the central nurvous system in the bulbar region of the pons neucleii and anterior horn of the cord. Some workers have observed noticeable effect on autonomic nervous system. In guinea pig dying from this toxine miliary necrosis of the parenchyma of the liver was observed by some workers. The toxic effect is due to the toxine. The organism is a saprophyte found in soil and in excreta of pigs and birds, etc. Epidemiological data regarding mode of infection have been well described, the organism being imbibed through contaminated meat, pork, fish and even vegetables particularly beans manured with contaminated fæces. The toxine can withstand freezing, if incorporated in fruits and vegetables previous to freezing. Their distribution in different soils and epidemiological bearings are admirably described. Workers interested in food poisoning and similar clinical conditions will find the monogram is very valuable. K. P. MENON.

A Mathematical Theory of Shaded-Pole Motors. By Erik Morath, *Transactions of the Royal Institute of Technology*, Stockholm, Sweden, Nr. 26, 1949.

The history of shaded-pole motors started in 1894 when it was found that by short circuting

a portion of the pole, a salient pole squirrel cage motor could be run on single phase. The saving in cost due to this winding and a centrifugal starting switch compared so favourably with the distributed field winding that the 'shaded' pole motor has held its field over all the other types of single phase motors below 1/20 H.P. W. G. Morill (*Trans. AIEE*, 1929, **48**, 614-29) has done pioneer work in the field of fractional horsepower motors and has in his AIEE paper ably analysed their characteristics with the aid of the Double Revolving Field Theory. Interesting methods of determining the starting and running performance characteristics of the shaded pole motor both theoretically and experimentally has also been published by F. H. Trickey (*Trans. AIEE*, 1947, **66**, 143).

In the present monograph Mr. Morath has successfully applied this two-rotating-field theory to the solution of shaded pole-motors.

The author has started with certain basic assumptions and presented the equivalent circuits of the motor, thus providing a powerful tool in the hands of the design engineer for studying the effects of motor constants. The first section of the analysis is confined to the fundamentals of the m.m.f. curves and then effects of harmonics are dealt with under a separate heading.

The analysis is supplemented by experimental curves and compared with computed values. The effects of coupling factor, shading coil arc, resistance of shading coils, etc., on the performance characteristics of the motor have been graphically represented. The author has not, however, indicated in his paper how the constants of the motor have been determined, except for the statement that these are determined in the usual way. None of the papers on the subject has indicated the method for the determination of the constants.

Although the shaded-pole motor is the simplest of all the single phase motors so far as construction is concerned, it is the most difficult to analyse from the mathematical standpoint. The author's approach to the problem marks really a milestone in the design of shaded-pole motors. The subject has been treated in an able manner. The material covered is of interest to the academic men as well as to the design engineers. The author is to be commended for this fine and useful work.

C. S. G.

Pulses and Transients in Communication Circuits. By Colin Cherry. (Published by Chapman & Hall Ltd.). Pp. 312. Price 32*sh.* net.

The study of television, pulse modulation, radar, picture telegraphy and similar subjects involves a thorough knowledge of transient response of networks. When dealing with these subjects one is generally confronted with the problem of waveform distortion. In such cases it is not sufficient to know only band-width but also the knowledge of the response to waves of given shape—pulse or steepedged waves—is essential. A great mass of literature has accumulated concerning the transient behaviour of communication circuits but most of the information concerned therein is expressed in the form and style of the professional mathematician. This creates difficulties for engineers accustomed to the ideas and practices of sine wave type technique and who want to supplement their knowledge of steady state circuit theory by a study of transients. This book which is an introduction to circuit transient analysis for communication engineers will serve to bridge the gap between the conventional method of a.c. theory and operational methods of analysis.

The first chapters after briefly reviewing some of the fundamental ideas, such as laws of network behaviour, impedance functions, free and forced oscillations in a mesh, etc., establishes the physical ideas behind the solutions of differential equations associated with linear circuits and explains the difference between initial impedance and steady state impedance. In a.c. vector theory both trigonometrical and expotential notations are used. Chapter 2 points out the convenience of using the latter notation. After explaining the conjugate vectors the chapter deals in more detail with the frequency spectra of modulated waves, pulses and transients by means of Fourier analysis. In practice all wave forms are produced by some types of electric circuits. The steady state characteristics of circuits form the subject-matter of the next chapter. After classifying the networks into different groups and dealing with several definitions such as transfer functions, transfer impedance, etc., system of conjugates is applied to explain the selectivity characteristics of communication networks. After considering the effects of dissipation on the steady characteristics, the chapter concludes by discussing the "low pass-band pass analogy".

The complete steady state characteristics discussed in Chapter 3 may be utilised to determine the response of communication networks to a transient wave, provided the magnitude and phase shift distortion of every Fourier component in the applied transient introduced by the network be considered. Chapter 4 is concerned with the response of networks. The spectrum of output response transient involves Fourier integral. In many cases, evaluation of Fourier integral becomes difficult. So the method of attack to determine the transient response of a network by means of steady state characteristics is limited. However, the ideas behind the method are of great importance and can be made useful for practical computations of transient response which can be extremely helpful for finding an approximate answer. Two examples, 'response of a network to a symmetrical drying waveform' and 'response of a network to a skew-symmetrical driving waveform' elucidate the usefulness of trigonometrical notations as they make more apparent the symmetry relations between the components of spectra and of network characteristics. The case of a resistance loaded tetrode amplifier with regard to its response to transients has also been considered by Fourier integral as an illustration. The response of a linear network to a transient having complex wave forms, which, if not possible to be expressed analytically, may be derived by considering the transient to consist of a number of step waves of suitable amplitudes and times of starting. By finding an analytical expression for the response of a network to a step wave, it is possible to find the response to other transients of known analytical form by means of Hamel's integral, provided the integral can be evaluated. The step wave is a basic wave form in circuit transient analysis and from this point of view, this method merits attention. The chapter ends with a consideration of the circuit response to an extremely short pulse. It is sometimes necessary to know the general points regarding band width or build-up time instead of exact transient response. Chapter 5 deals with the approximation which simplifies to a great degree the calculations of transient response. It is also shown how by assuming certain geometric shapes of characteristics, soluble Fourier integrals may be obtained and the relation between band width and build up time can be determined with comparative ease. In television and radar channels it is necessary to produce certain desirable forms of response characteristics with a number of amplifier stages. Chapter 6 is concerned with the transient response of multistage amplifier consisting of tetrode or pentode valves with particular reference to accuracy of signal reproduction. At the end of the chapter, signal to noise ratio and band width is discussed. Chapter 7 discusses thoroughly the effects of unequal distortion of sidebands of an amplified modulated carrier and a method has been described by means of which distortion of steady state signal or transient wave with any depth of carrier modulation and any type of channel characteristics may be calculated. This chapter requires a careful study. In the last chapter response of communication networks to very short impulses has been dealt with. This chapter introduces the idea of echoes to explain clearly the physical meaning of signal distortion and gives a clear picture of Fourier Transforms, avoiding at the same time mathematical complexities. This book ends with an appendix on the probability function response characteristics.

It is hoped that this book with its careful and lucid expositions of a difficult subject, will prove to be a very important and useful contribution to scientific literature. The author is to be congratulated for his successful attempt in presenting a clear physical picture of transient analysis. This book is strongly recommended to those especially who are engaged in radar and television work.

S. K. C.

The Floral Year. By L. J. F. Brimble. (London: Macmillan & Co., Ltd.), 1919. Pp. xiv+622. Illustrated 30*sh.* nett.

The Floral Year is a book which may be appropriately described as nautre's pageant of colour in print. It is a fascinating book which takes one closer to nature in a more pleasing way than many other books on natural history can do. It has the touch of an artist apart from that of a botanist. Mr. Brimble, the author, who is well known for the several popular books written on botany, will now increase his popularity by bringing out this book which is different in many respects. Even popular books on plants have to conform to some system or classification in their treatment but *The Floral Year* follows more the nature's calendar which is more flexible than the rigid calendar of an astronomer. It is nature's floral almanac which obviously cannot adhere too rigidly to say set rules but all the same appears to con-

form generally to seasonal influence in a broad sense.

The author's treatment of the floral march or procession commences with the winter season symbolically the quiescent or the passive period of nature, when nature reveals more of its bleaker aspect and progresses through the spring and autumn which bring forth the richness and grandeur of the plant world. The autumn culminates in the mellow and subdued aspect of nature, rich in its bounty of ripened seeds and fruits and the gathering harvest. The pageant reveals that there is colour almost the year round. Even at the peak of winter season there is enough colour observed in the dark green of the yew, the scarlet berries and the glassy green leaves of the holly and the snowwhite berries of the mistletoe which decorate the homes at Christmas-tide. The winter scene outlining the trees and shrubs shrouded in a mantle of white revealing the outline of every twig is something majestic and unforgetable.

This fascinating book is enlivened by beautiful verses from such great authors as Chaucer, Shakespeare, Wordsworth, Gray, Milton, Goldsmith, Shelley, Keats and Whitman, Coleridge Bridges, Sack Ville-West, Walter-De La Mare and many others. All this is beautifully blended with information on the season of the year, the general characteristics of the plant, the peculiarities of the habitat and the uses of the plants that flower in different months beginning with January.

In the introductory chapter the author gives in brief non-technical terms, the botany, to enable the amateur to get a knowledge of the different types and parts of plants, the life-cycle including the processes of formation of flower and fruit and lastly the classification.

The book contains a large number of good illustrations and 24 very beautiful coloured plates. This book should be welcomed by all lovers of plants, both amateur and professional and it should find a place on the library shelf of all colleges and schools.

The excellent get-up leaves nothing to be desired.

L. S. S. KUMAR.

Essentials of General Cytology. By R. A. R. Gresson (Edinburgh University Press, Edinburgh), 1948. Pp. ix+184. Price 21 *sh.* net.

The Edinburgh University Press have issued a book on the general cytology of plants and animals as No. 2 in the series 'Science and Mathematics'. The book has been prepared by Dr. Gresson with contributions on plant cytology by Helena Heslop Clark. The book is intended to give a groundwork on both animal and plant cytology and deals with nuclear as well as cytoplasmic structures.

In a subject of such vast scope each author has to make his own choice as to what he is to retain and what to omit. The present book deals comprehensively with microscopic structure and omits much of physiology and biochemistry of the cell. A student who wishes to specialise in microscopy will find the essentials clearly presented, and as intended, the book will be helpful to teachers of this subject. Three aspects of cytology get detailed treatment, the chromosomes in relation to heredity, structure of Golgi material, and morphology of reproductive structures in plants. There are brief chapters on cytology of Protozoa and cytology of pathological animal cells.

The author's special subject Golgi Material gets detailed treatment, and in comparison to this topic, the other subjects are briefly discussed. The space devoted to reproduction in plants could have been better devoted to more rigorous treatment of connection between Mendelism and chromosomes, for, the first mentioned subject is fully dealt with in text-books of Botany. The groundwork in Genetics becomes important if the chapters on chromosomes and evolution, and cytoplasm and heredity are to be useful. In this manner it is possible to mention other topics worth greater detail, *e.g.*, chloroplasts, plant cell wall, or the enormous variation in differentiated plant or animal cells. However, Dr. Gresson's selection is a welcome addition to books on cytology.

The illustrations and plates of microphotographs are excellent and would be of great use to the student. As indicated in the jacket, the book represents the highest tradition of Scottish typography. Only error detected was in p. 161 para 5 where 10 grams is stated and 1 gram is probably intended.

C. G.

A Study of the Influence of Impurities in the Solvent on the Induction Periods, and Rate of Formation of Grignard Compounds.

Making a systematic study of the course of the Grignard reaction, H. Mackle (*Proceedings of the Royal Irish Academy*, Volume LII, Section B, No. 4, December 1948) has shown that when the reaction was carried out in commercial ether dried over sodium wire, the induction period was 14·3 minutes. With ether purified elaborately by successive treatment with

water, potassium bicarbonate solution, saturated mercuric chloride, strongly alkaline potassium permanganate and concentrated ferrous sulphate solution, and then washing with water and drying and distilling over sodium, the induction period was only 5·1 minutes. When ether purified as above and then once again distilled over MeMgI was used, in addition to the reduction in the induction period, the yield also increased considerably.

The author has confirmed that the Grignard reaction proceeds much slower in benzene than in ether.

A simple method for measuring the relative induction periods and relative rates of formation of Grignard compounds is described and the mechanism of their formation is discussed.

B. H. IYER.

SCIENCE NOTES AND NEWS

Hospital Section for P.A.S.B.

The Pan American Sanitary Organisation, which is also the Regional Office of WHO, is establishing a new section to deal with the problems of surveying, planning, equipping, and modern methods of administration and management of hospitals of the participating governments. Mr. Felix Lamela has been appointed its Chief, with offices at the P.A.S.B. Hqrs. at Washington D.C. The immediate programme of activities includes the organization of the Third Inter-American Institute for Hospital Administrators which will be held in Rio de Janeiro, Brazil, in April 1950. The Brazilian Government, through the Ministry of Education and Public Health, has appropriated the sum of 300,000 cruzeiros ($ 15·000) as grant-in-aid to cover in part the cost of organization of this short, intensive academic course of study for hospital administrators of the Western Hemisphere. A prominent group of outstanding educators of the leading educational institutions will form the faculty.

Decrease in Solar Activity

The Kodaikanal Observatory (Annual Report, 1948) observes that the sunspot activity reached its maximum by the middle of 1947 and declined in 1948; and that there has been an equatorial drift of the zones of maximum sunspot activity and a poleward drift of the zones of maximum prominence activity. Twice in 1948, the sun's disc was free from spots unlike the previous two years. Visual and photographic observations of the brilliant comet which appeared in the southeastern sky at dawn in November 1948 were made between November 11 and December 14. The magnetic observatory has a project to correlate solar phenomena with terrestrial magnetic disturbances.

M.Sc. Degree Award

On the recommendation of the Board of Examiners the thesis entitled "Histological Study of Endocrine Organs of *Pteropus Edullis*" by Mr. C. Seetaramayya, M.B.B.S., has been declared to qualify for the M.Sc. degree in Physiology of the Andhra University.

National Nutrition Association of India

The All-India Nutrition Board, founded in 1936, has been reconstituted into the National Nutrition Association of India. Its inauguration was held on 3rd September at Darbhanga Hall, Calcutta. Dr. A. C. Ukil, welcoming the delegates, referred to the import of 4-5 million tons of cereals costing about Rs. 250 crores.

The Honourable Rajkumari Amrut Kaur inaugurating the session discussed how the newer knowledge of Nutrition could help to improve the diet of the lower economic groups. She urged the greater use of subsidiary foods, like sweet potato flour, defatted groundnut cake and potato, with a view to conserve foreign currency.

During the session symposia on (a) Food processing and Food supplements, (b) Population, Production and Public Health, (c) Nutrition Research, were held.

Award for Wool Research

Mr. T. MADHAVA MENON, M.Sc. (Leeds), Professor of Applied Chemistry, Maharaja's College, Ernakulam, has been awarded a Certificate of Merit and Silver Medal by the Worshipful Company of Woolmen of Great Britain in appreciation of his thesis on "The Supercontraction of Animal Fibres". Associated with this award is a money prize offered by the British Wool Federation.

Editor: M. Sreenivasaya, B.A., F.I.I.Sc., F.A.Sc.
1232-49 Printed at The Bangalore Press, Bangalore City, by G. Srinivasa Rao, Superintendent and Published by Dr. M. A. Govinda Rau, M.A., Ph.D., for the Current Science Association, Bangalore.